

## CLAIMS

What is claimed is:

1. A method for determining a scattering zone associated with a communication unit, said method comprising:
  - transmitting a reference signal using a first beam configuration;
  - transmitting a probing signal using a second beam configuration;
  - estimating a phase difference between said reference signal and said probing signal as received at said communication unit; and
  - estimating said scattering zone using information with respect to said phase difference estimation.
2. The method of claim 1, further comprising:
  - altering at least one of said first and second beam configurations and repeating said transmitting said reference and probing signals and said estimating said phase difference.
3. The method of claim 2, wherein said estimating said scattering zone comprises:
  - determining a beam configuration providing a least phase difference
4. The method of claim 3, wherein said determining a beam configuration providing a least phase difference comprises:
  - determining a beam configuration providing said least phase difference having a least beam width.
5. The method of claim 1, wherein said first beam configuration provides a wider beam than said second beam configuration.
6. The method of claim 5, wherein said first beam configuration provides a substantially omni-directional beam.
7. The method of claim 5, wherein said first beam configuration provides a sector beam configuration.
8. The method of claim 1, wherein said reference signal comprises a pilot signal.

9. The method of claim 1, wherein said probing signal comprises a system native data stream.

10. The method of claim 9, wherein said system native data stream comprises a reverse link transmit power control signal.

11. The method of claim 9, wherein said probing signal is utilized as a dedicated pilot by said communication unit.

12. The method of claim 11, further comprising:  
increasing a relative power associated with the probing signal as transmitted in the second beam configuration, for use of the probing signal as a dedicated pilot, over that of a wide beam transmission of the probing signal.

13. The method of claim 1, wherein said estimating said phase difference comprises: correlating said reference and probing signals as received at said communication unit.

14. The method of claim 1, further comprising:  
estimating a highest data rate for use with said communication unit as a function of said phase difference estimate.

15. The method of claim 1, further comprising:  
transmitting a probing signal using a third beam configuration;  
estimating a second phase difference between said reference signal and said probing signal transmitted using said third beam configuration as received at a second communication unit; and  
estimating a scattering zone with respect to said second communication unit using information with respect to said second phase difference.

16. The method of claim 15, further comprising:  
determining two or more communication units of a plurality of communication units for simultaneous communication as a function of corresponding scattering zone estimates, wherein said plurality of communication units includes said communication unit and said second communication unit.

17. The method of claim 16, further comprising:

scheduling communications with respect to said two or more communication units as a function of a highest aggregate data rate associated with groups of said two or more communication units determined to be compatible for said simultaneous communications.

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18. A system for determining a scattering zone associated with a communication unit, said system comprising:

- means for transmitting a reference signal using a first beam configuration;
- means for transmitting a probing signal using a second beam configuration;
- means for estimating a phase difference between said reference signal and said probing signal as received at said communication unit; and
- means for estimating said scattering zone using information with respect to said phase difference estimation.

19. The system of claim 18, further comprising:

- means for altering said second beam configuration;
- means for repeating said transmitting said probing signal using said altered beam configuration; and
- means for repeating estimating said phase difference.

20. The system of claim 19, wherein said means for estimating said scattering zone comprises:

- means for determining a beam configuration providing a least phase difference.

21. The system of claim 20, wherein said means for determining a beam configuration providing a least phase difference comprises:

- means for determining a beam configuration providing said least phase difference having a least beam width.

22. The system of claim 18, wherein said first beam configuration provides a wider beam than said second beam configuration.

23. The system of claim 22, wherein said first beam configuration provides a substantially omni-directional beam.

24. The system of claim 22, wherein said first beam configuration provides a sector beam configuration.

25. The system of claim 18, wherein said reference signal comprises a pilot signal.

26. The system of claim 18, wherein said probing signal comprises a system native data stream.

27. The system of claim 26, wherein said system native data stream comprises a reverse link transmit power control signal.

28. The system of claim 26, further comprising:  
means for using said probing signal as a dedicated pilot by said communication unit

29. The system of claim 28, wherein said means for using said probing signal as a dedicated pilot comprises:

means for increasing a relative power associated with the probing signal as transmitted in the second beam configuration over that of a wide beam transmission of the probing signal.

30. The system of claim 18, wherein said means for estimating said phase difference comprises:

means for correlating said reference and probing signals as received at said communication unit.

31. The system of claim 18, further comprising:  
means for estimating a highest data rate for use with said communication unit as a function of said phase difference estimate.

32. The system of claim 18, further comprising:  
means for transmitting a second probing signal using a second beam configuration;  
means for estimating a phase difference between said reference signal and said second probing signal as received at a second communication unit; and  
means for estimating a second scattering zone using information with respect to said second phase difference estimation.

33. The system of claim 32, further comprising:  
means for determining two or more communication units of a plurality of communication units for simultaneous communication as a function of corresponding scattering zone estimates, wherein said plurality of communication units includes said communication unit and said second communication unit.

34. The system of claim 33, further comprising:

means for scheduling communications with respect to said two or more communication units as a function of a highest aggregate data rate associated with groups of said two or more communication units determined to be compatible for said simultaneous communications.

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35. A system for providing simultaneous communication links without unacceptable interference therebetween, said system comprising:

an antenna array having a plurality of antenna elements;

a scattering zone estimator coupled to said antenna array, wherein said scattering zone estimator determines scattering zone information with respect to communication units of a plurality of communication units; and

a beam former coupled to said antenna array, wherein said beam former provides beam forming for simultaneous communication of a signal associated with a first communication unit of said plurality of communication units and a signal associated with a second communication unit of said plurality of communication units, wherein said beam forming includes forming a first beam associated with said first communication unit as a function of corresponding said scattering zone information and a second beam associated with said second communication unit as a function of corresponding said scattering zone information.

36. The system of claim 35, wherein said scattering zone estimator comprises:

a control algorithm operable upon a processor based system controlling operational aspects of a wireless communication station.

37. The system of claim 36, wherein said operational aspects of said wireless communication station include controlling said beam former to form said first beam for transmission of a first probing signal associated with said first communication unit, and wherein said scattering zone estimator determines said scattering zone information associated with said first communication unit as a function of a phase difference between said first probing signal as transmitted in said first beam and a reference signal as transmitted in a third beam.

38. The system of claim 37, wherein said first beam provides a more narrow beam configuration than said second beam.

39. The system of claim 37, wherein said first probing signal comprises a system native signal.

40. The system of claim 39, wherein said system native signal comprises a reverse link power control data stream associated with said first communication unit.

41. The system of claim 37, wherein said first probing signal is utilized as a dedicated pilot for said first communication unit with respect to data transmitted using said first beam.

42. The system of claim 37, wherein said operational aspects of said wireless communication station include controlling said beam former to form said second beam for transmission of a second probing signal associated with said second communication unit, and wherein said scattering zone estimator determines said scattering zone information associated with said second communication unit as a function of a phase difference between said second probing signal as transmitted in said second beam and a reference signal as transmitted in a third beam.

43. The system of claim 37, wherein said operational aspects of said wireless communication station include controlling said beam former to form a plurality of beams for transmission of said first probing signal, wherein said plurality of beams includes said first beam and at least a beam having a more narrow configuration than said first beam, and wherein said scattering zone estimator further determines said scattering zone information associated with said first communication unit as a function of a phase difference between said first probing signal as transmitted in said beam having a more narrow configuration and said reference signal as transmitted in said third beam.

44. The system of claim 35, further comprising:

a direction estimator coupled to said antenna array, wherein said direction estimator determines an estimate of direction of communication units of said plurality of communication units with respect to said antenna array, wherein said first beam is further formed as a function of said direction estimation associated with said first communication unit and said second beam is further formed as a function of said direction estimation associated with said second communication unit.



45. A system for providing simultaneous wireless communications with respect to a plurality of communication units, said system comprising:

an antenna array having a plurality of antenna elements;

and array response vector estimator coupled to said antenna array, wherein said array response vector estimator accepts a plurality of signals associated with said plurality of antenna elements and provides array response vector information with respect to a response of said antenna array for a first communication unit of said plurality of communication units and for a second communication unit of said plurality of communication units;

a direction estimator coupled to said array response vector estimator, wherein said direction estimator utilizes said array response vector information to estimate a direction of said first communication unit with respect to said antenna array and a direction of said second communication unit with respect to said antenna array;

a scattering zone estimator coupled to said antenna array, wherein said scattering zone estimator provides scattering zone information with respect to a scattering zone associated with said first communication unit and a scattering zone associated with said second communication unit; and

a beam former coupled to said antenna array, wherein said beam former provides beam forming for communication of a first payload signal associated with said first communication unit as a function of said direction estimation and said scattering zone information and for communication of a second payload signal associated with said second communication unit as a function of said direction estimation and said scattering zone information.

46. The system of claim 45, wherein said scattering zone estimator utilizes a plurality of different beam configurations with respect to said first and second communication units to determine a beam configuration associated with said first communication unit indicative of said scattering zone associated with said first communication unit and to determine a beam configuration associated with said second communication unit indicative of said scattering zone associated with said second communication unit.

47. The system of claim 45, wherein said scattering zone information is determined as a function of a first unique data signal associated with said first communication unit transmitted in a first beam configuration, a second unique data signal associated with said second communication unit transmitted in a second beam configuration, and a common signal transmitted using a common beam configuration.

48. The system of claim 47, wherein said first unique data signal comprises a first native data stream associated with said first communication unit, and wherein said second unique data signal comprises a second native data stream associated with said second communication unit.

49. The system of claim 48, wherein said first and second native data streams comprise a reverse link power control signal.

50. The system of claim 48, wherein said first unique data signal as transmitted in said first beam configuration is utilized as a dedicated pilot for demodulation of said first payload signal, and wherein said second unique data signal as transmitted in said first beam configuration is utilized as a dedicated pilot for demodulation of said second payload signal.

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